

## TYPHOON ED (19W)

### I. HIGHLIGHTS

Ed, which had the second longest track (3150 nm (5835 km)) of any "straight runner" in 1990, formed in the Marshall Islands and continued westward for nearly two weeks before finally making landfall in northern Vietnam. It was the third of six tropical cyclones to form in September.

### II. CHRONOLOGY OF EVENTS

- 080600Z - First mentioned on Significant Tropical Weather Advisory as an area of persistent convection with an estimated minimum sea-level pressure of 1008 mb.
- 090730Z - First Tropical Cyclone Formation Alert based on increased in convective organization; synoptic data in the area indicating a small compact surface circulation; and favorable outflow conditions aloft.
- 100600Z - Second Tropical Cyclone Formation Alert based on persistent, well developed low-level circulation indicated by synoptic data.
- 101200Z - First warning followed improved organization in the convection, fair upper-level outflow in all quadrants and the first intensity estimate of CI 2.0.
- 121200Z - Upgrade to a tropical storm based on synoptic data, consolidation of the convection, improved upper-level outflow and the first intensity estimate of CI 2.5.
- 140000Z - Upgraded to typhoon due to better definition in the spiral banding, development of a partial eye wall and the first intensity estimate of CI 4.0.
- 181800Z - Downgraded to tropical storm based on a decrease in central convection, and an intensity estimate of CI 3.5.
- 200000Z - Downgraded to a tropical depression after a decrease in organization, land interaction and an intensity estimate of CI 2.0.
- 200600Z - Final warning - dissipated over land - issued as Ed moved inland over northern Vietnam.

### III. TRACK AND MOTION

As a disturbance, Ed initially tracked northwestward in response to the deep layer flow around the subtropical anticyclone to the northeast (Figure 3-19-1). The tropical cyclone became involved in a

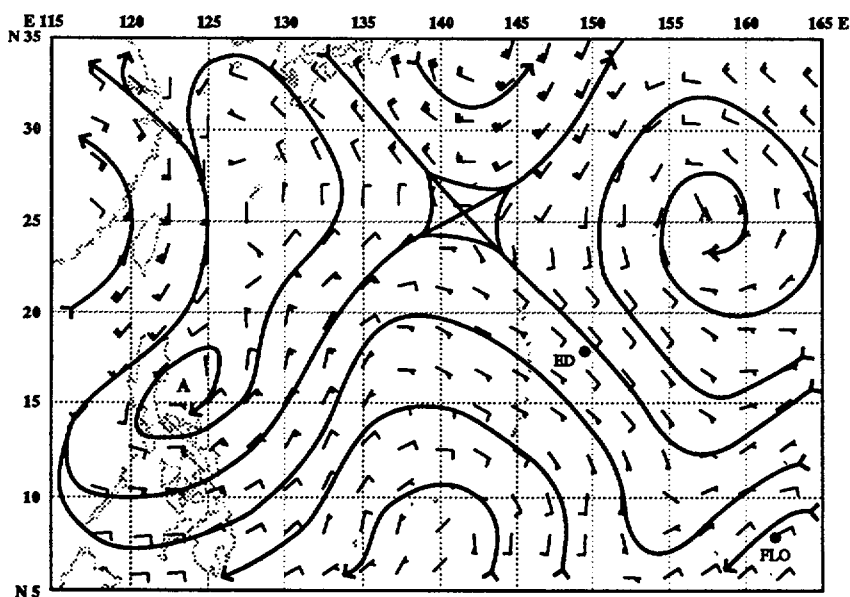


Figure 3-19-1. NOGAPS deep layer mean analysis from 090000Z September showing Ed embedded in southeasterly flow associated with the anticyclone to the northeast. Flo (20W) is located to the southeast of Ed.

ridge building process to the north and took a more westerly track on 10 September. Then the mid-level ridge strengthened to the north (Figure 3-19-2) and the typhoon turned west-southwestward at 140000Z. For four days Ed continued to track to the west-southwest before turning northwestward along the coast of Vietnam. The northwestward turn appeared to be the combined result of the steering flow becoming southerly when a mid-level ridge formed between Ed and Flo (20W)(Figure 3-19-3), and the barrier

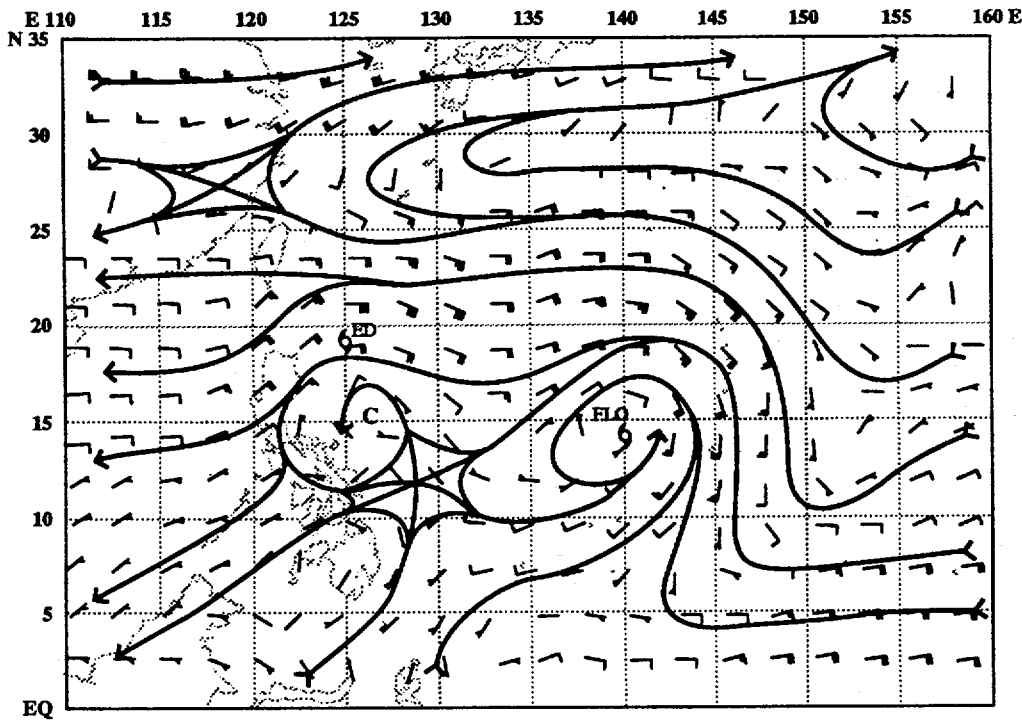
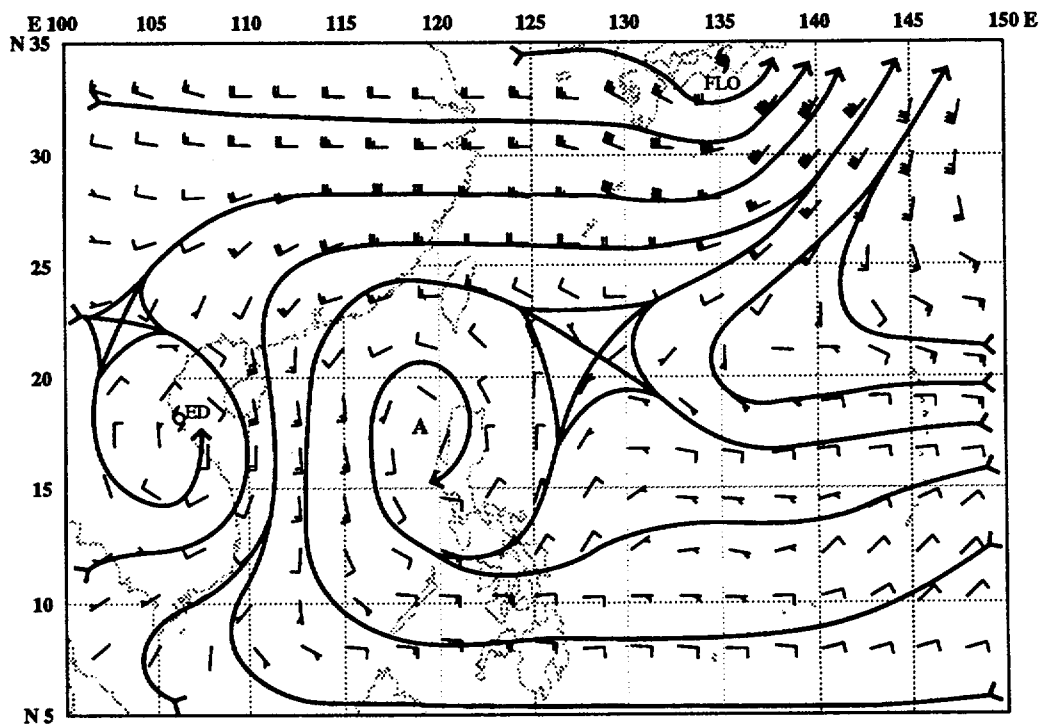


Figure 3-19-2. NOGAPS deep layer mean analysis from 140000Z September shows the increased wind flow between Ed and the building subtropical ridge to the north. Flo (20W) is located to the east-southeast of Ed.

Figure 3-19-3. NOGAPS deep layer mean analysis from 191200Z September shows a mid-level anticyclone over the Philippine Islands producing southerly flow across the South China Sea.



effect of the coastal mountains of Vietnam.

#### IV. INTENSITY

On 10 September, Ed's compact cluster of cumulonimbus clouds moved into a more favorable upper-level environment with low vertical wind shear. At the same time, the disturbance which would later become Flo (20W), was rapidly taking shape southeast of Guam (Figure 3-19-4). The 20-30 kt (10-15 m/sec) low-level monsoonal southwesterlies to the south aided the development of both systems. Intensification continued at a normal rate of one T-number per day, and Ed became a typhoon on 14 September (Figure 3-19-5). The tropical cyclone maintained typhoon intensity until it struck the Vietnamese coast on 18 September.

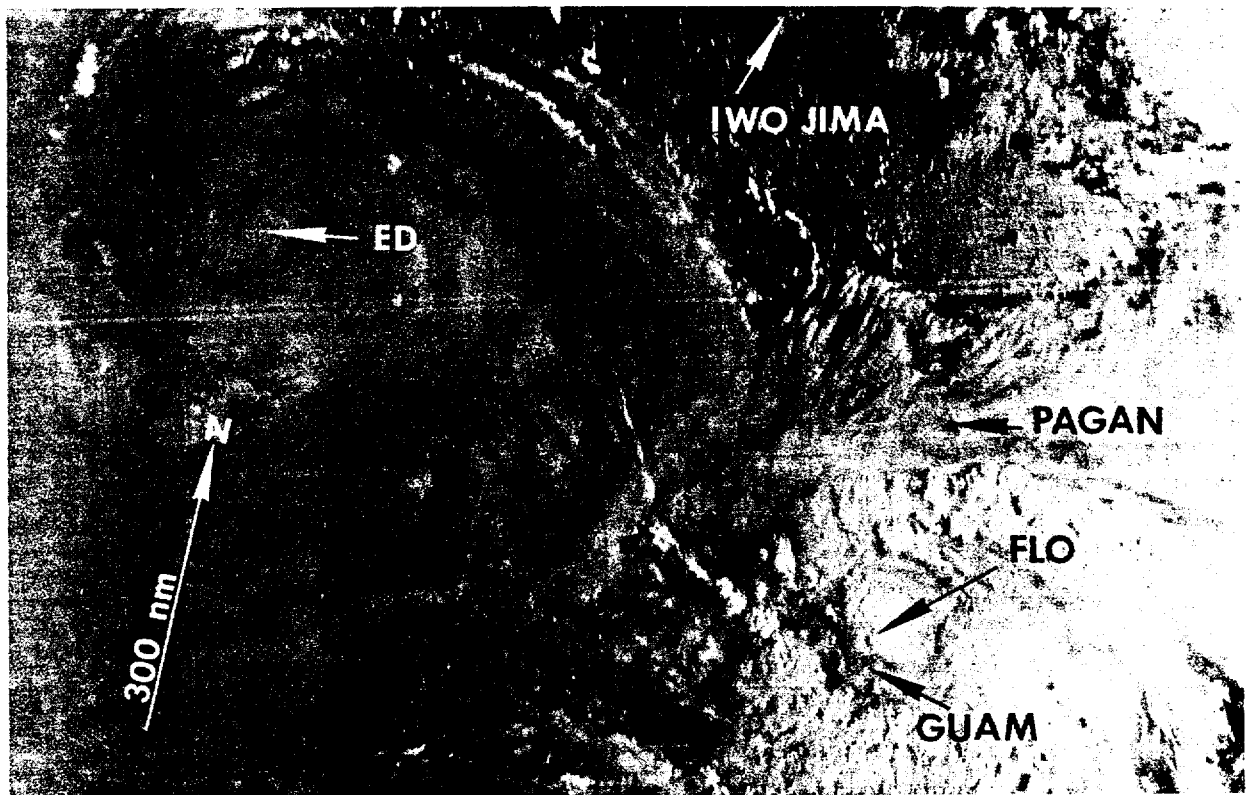


Figure 3-19-4. Tropical Storm Ed as it moves westward across the Philippine Sea. Tropical Storm Flo is rapidly developing to the southeast near Guam (122042Z September DMSP visual imagery).

## V. FORECASTING PERFORMANCE

The overall JTWC forecast performance is shown in Figure 3-19-6. The initial forecasts were to the right of Ed's westward track and were influenced by the NOGAPS 500-mb prognostic series, which continued to forecast significant weakening of the mid-level ridge over the East China Sea. The ridge actually strengthened, keeping the tropical cyclone on a more westward track. JTWC was strongly influenced by the dynamic aid, OTCM, which forecast a west-northwestward track throughout Ed's life. Of interest, the dynamic aid FBAM, which used the smoothed deep layer mean fields for steering, correctly forecast Ed's turn to the southwest, but missed the track change off Vietnam.

## VI. IMPACT

No information was received.

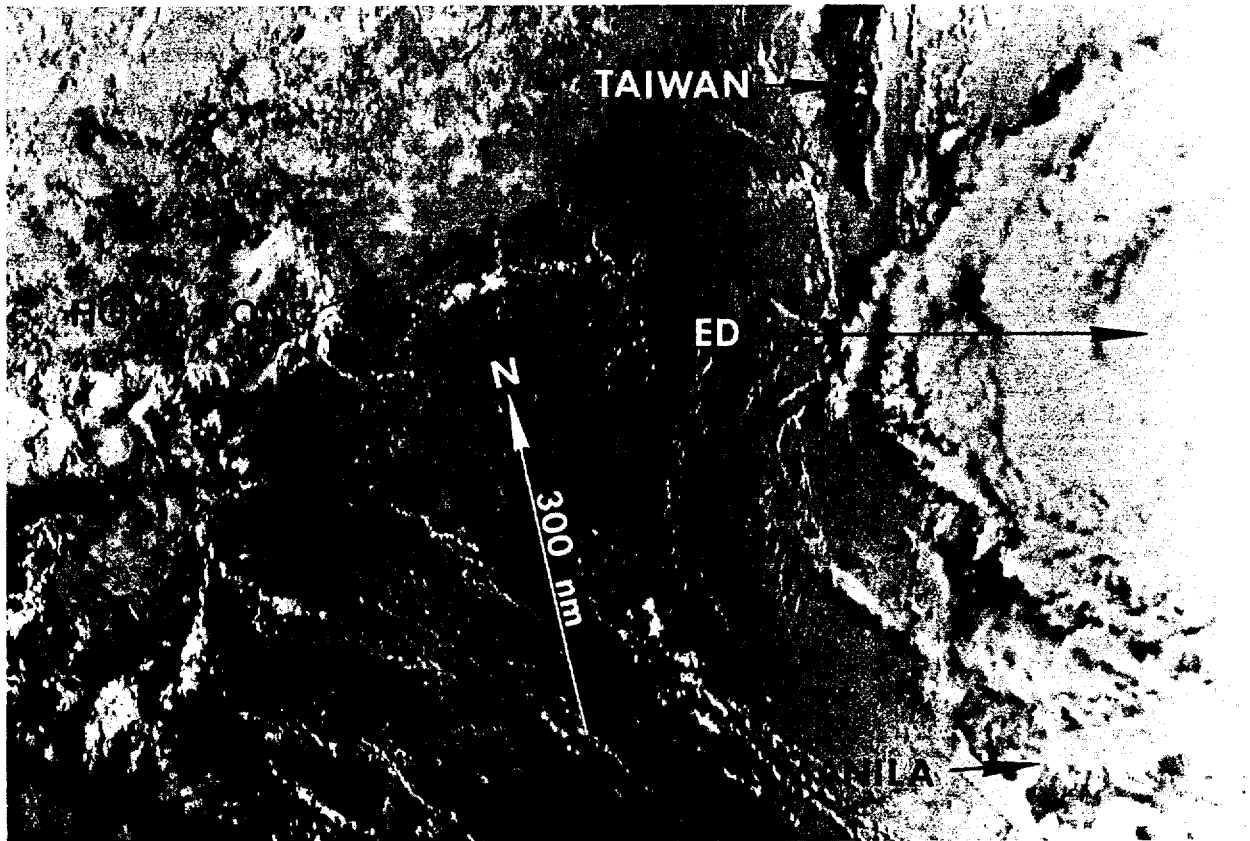


Figure 3-19-5. Typhoon Ed approaches the Straits of Luzon (140007Z September NOAA visual imagery).

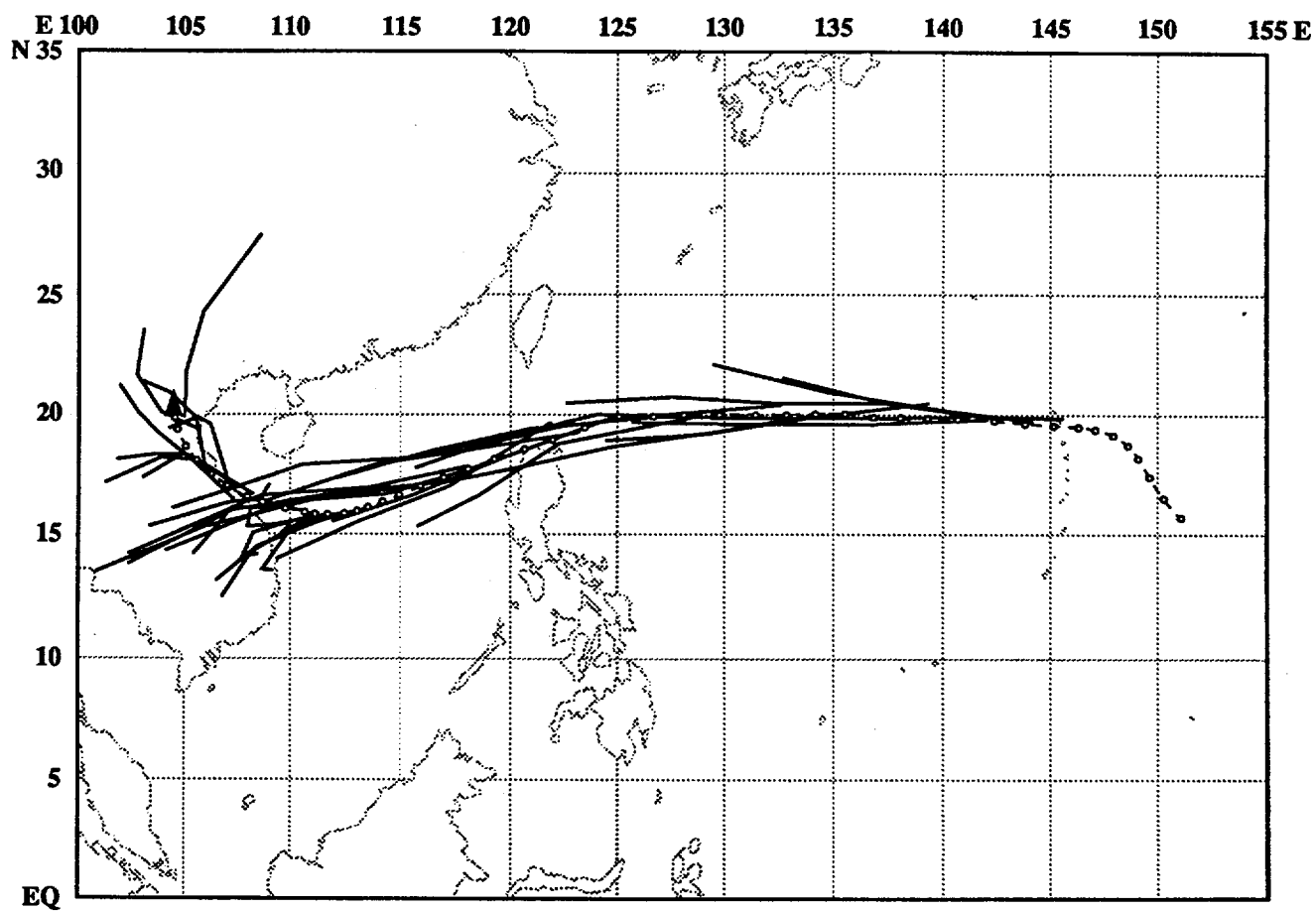


Figure 3-19-6. Summary of JTWC forecasts (solid lines) for Ed superimposed on the final best track (dashed line).